Zero Retries issue 0223 2025-10-10

Zero Retries is an independent newsletter promoting technological innovation in and adjacent to Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Radios are computers - with antennas! Now in its fifth year of publication, with 3200+ subscribers.

About Zero Retries

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Commentary by Editor Steve Stroh N8GNJ

Paid Subscribers Update

My thanks to **Prefers to Remain Anonymous 54** for *renewing* as an **Annual Paid Subscriber** to Zero Retries this past week!

Financial support from Zero Retries readers is a significant vote of support for the continued publication of Zero Retries.

The Serenity Prayer for Amateur Radio

In a private discussion group I'm a member of, the "regulars" include a number of very intelligent, accomplished folks from many countries. A recent item of discussion was a particular intellectual activity. The discussion soon changed from the activity, to discussion that the activity was futile, given "so much is going wrong these days… surely there are bigger, more important issues to focus one's energy and attention on".

Perhaps. But then there are times when "issues" can be so overwhelming as to be paralyzing. At times, I'm guided by the essential wisdom of the Serenity Prayer:

> The serenity to accept the things I cannot change,
> The courage to change the things I can,
> And the wisdom to know the difference.

So maybe focus on things that one can *personally* affect. In my case, diving deep to report out and advocate for technological innovation in Amateur Radio here in Zero Retries. Maybe, just maybe, such actions can change the world for the better, at least a little bit.

Weekends Are For Amateur Radio! ***Conferences - Like Pacificon 2025***

Welcome to the new Zero Retries subscribers / readers discovering Zero Retries at Pacificon 2025!

Pacificon has become my second (only to Zero Retries Digital Conference) favorite Amateur Radio conference because of its proximity to Silicon Valley, California. I'm routinely overhearing Zero Retries Interesting conversations that I just don't hear at other conferences (again, other than ZRDC). Of course, there were similar ZRI conversations overheard at GRCon 2025, but that wasn't specifically an Amateur Radio conference.

open.space (see ZR > BEACON article) will, I predict, be a showstopper at Pacificon 2025, but there's plenty of Zero Retries Interesting exhibitors (FreeDV is next to us) and presentations.

I'm looking forward to a lot of ZRI conversations at the Zero Retries booth.

Image courtesy of Zero Retries

As I lead off with to passers-by who have no idea what Zero Retries is:

We're selling free subscriptions to an Amateur Radio newsletter.

I developed a one-page handout about Zero Retries:

Zero Retries Flyer For Conferences 2025-10-12
157KB · PDF file
Download
Download

which increases the interest in Zero Retries considerably.

I also developed a one-page handout about M17:

M17 Handout N8GNJ 2025-10-10
121KB · PDF file
Download
Download

And we have the double sided postcards about DLARC. I need to make a new sign for those, like Kay Savetz K6KJN had to do to grab attention at Pacificon 2024:

Free online Ham Radio library!

Have a great weekend, all of you co-conspirators in Zero Retries Interesting Amateur Radio activities!

Steve N8GNJ

Leave a comment

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Why Manufacturers May Be Reluctant About VHF / UHF / Microwave SDR "Real Radios"

By Steve Stroh N8GNJ

Here in Zero Retries, I've often bemoaned that there is not (yet) a "real radio" Software Defined Radio (SDR) for VHF / UHF / microwave operation, as a "turnkey" product, available for use in Amateur Radio. In my description, "real" denotes that a user can load whatever SDR software they want to on such a unit. "Real" also denotes having a transmit power output that is usable for typical Amateur Radio communications on VHF / UHF / microwave, such as at least 5 watts, preferable 25 or 50 watts.

I also brazenly predict that "someone" (an individual, or small business) will spot this unmet need for the Amateur Radio market and offer such a product.

A few weeks ago, Ismo Väänänen OH2FTG (ftg on Mastodon) wrote to me on Mastodon:

> I think one of the major reasons why there are no ready made, out of the box usable open source 100W or even 5W class SDR's is regulations.
>
> In USA it is 47 CFR § 2.944
> https://www.ecfr.gov/current/title-47/chapter-I/subchapter-A/part-2/subpart-J/subject-group-ECFRd5ad3b739dbf27a/section-2.944
>
> The line: "Manufacturers must take steps to ensure that only software that has been approved with a software defined radio can be loaded into the radio."
>
> Makes things very clear cut.
>
> This stuff almost killed openwrt and similar projects around 2015 - 2016 - see https://hackaday.com/2015/09/02/save-w
>
> You might also notice that all retail SDR's like HackRF are certified as laboratory equipment, not radios.
>
> That's also why they are exempt from the scanning receiver cellular blocking, as are spectrum analyzers with FM demodulators.

My thanks to OH2FTG for pointing this out, and, at first glance, that issue and adherence to the letter of the regulations, could intimidate potential manufacturers from creating a VHF / UHF SDR "real radio".

But perhaps not?

The Chinese manufacturers of "Amateur Radio" units don't seem to be intimidated by "… must take steps to ensure that only software that has been approved with a software defined radio can be loaded into the radio". I've mentioned a number of alternative software loads for various Chinese radios, and there is also the blurring of authorization requirements for multiple radio services such as Part 90 (Private Land Mobile Radio - commercial), Part 95 (General Mobile Radio Service), and Part 97 (Amateur Radio).

Wi-Fi and Wireless Internet Service Providers (WISP) radio units that can be updated with OpenWRT software is a more instructive example… though those are very low power to operate in the unlicensed bands.

Ultimately a workaround to making a usable VHF / UHF / microwave SDR available for Amateur Radio might be the simple expedient of making the power amplifier "optional", but easy to install. A similar approach is a common workaround for avoiding the necessity of full certification of some Amateur Radio products. That is, offer a unit as a kit that is *almost* entirely assembled and tested, but leave some "assembly" step, such as soldering on the power connector, or assemble the unit into the case and plug some components into sockets, etc.

Thus I remain optimistic that a real radio (not "test equipment") VHF / UHF / Microwave SDR unit might become available in the near term (the next couple of years, at most).

A very good first step is the Linux Handie Talkie (LinHT) project by the folks of the M17 Project to develop a fully (user) SDR in a portable radio form factor on the Amateur Radio 420-450 MHz band.

Leave a comment

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VARA FM Via FM (Analog) Repeater

By Steve Stroh N8GNJ and Scott Currie NS7C

For all the varying digital modes that have been created for Amateur Radio VHF / UHF bands, one of the fastest (with a few exceptions1), and easiest to implement for a wide area data communications system is a basic VHF or UHF FM repeater using some easily set parameters can make an FM repeater perform optimally for use with VARA FM.

Acknowledged that VARA FM is not open source, is designed to be used only on Windows, and there is the cost of $69 for a user license. All of those issues are addressed in the VARA FM chapter of the forthcoming book.

Steve is working on his forthcoming book **SuperPacket - the Zero Retries Guide to Amateur Radio in the 21st Century**.

As part of his research for the VARA FM chapter, regarding usage of VARA FM via FM repeaters, on the VARA website, in the document VARA FM 4.0 Features, there is this mention:

> Operation of VARA FM sessions thru voice repeaters is improved.

To clarify the usage of VARA FM via FM repeaters, Steve contacted Jose Alberto Nieto Ros EA5HVK, the creator of VARA FM.

Jose replied:

> VARA FM Narrow works starting from approximately 400 Hz which leaves space for CTCSS2 tones.
>
> VARA FM works best over analog (FM) repeaters when the repeater's delay parameters are configured properly.
>
> For relaying VARA FM, VARA FM digipeaters work better than analog (FM) repeaters.

Testing A Dedicated VARA FM Repeater

Steve also contacted Scott Currie NS7C who is one of the most experienced users and promoters of VARA FM

Scott replied:

In San Louis Obispo County (SLOC), California we have been testing a full duplex repeater for VARA FM operations for about a year now, with very good success. Although this repeater can still be used for voice operations, we have dedicated this repeater for data only. This repeater was supplied by the county radio shop at their facility on Cuesta Peak in SLOC. In the test configuration it is running a unity gain antenna not very high up on the tower, and is using a mobile duplexer. We are working to make this repeater permanent with a more suitable antenna and duplexer. The repeater is a Tait TB8100 on UHF.

After testing various configurations, we have found that VARA FM performs best with the following repeater configuration:

- CTCSS on receive only, no TX CTCSS,
- Zero drop delay / hang time,
- Flat audio on receive and transmit, no pre/de emphasis,
- Short CW ID, call sign only, with nominal 9 minute timing (no "smart" identification),
- No courtesy tone or any other signaling.

Running with zero drop delay results in Transmit Delay (TXD) well within VARA FM's range, and has prevented voice users from finding the repeater. They don't think there is a repeater there since they don't hear a drop delay. They also don't know what that weird noise is when a VARA FM user is active.

To use this repeater, as Jose mentioned, users set their VARA FM stations to use VARA FM NARROW mode. VARA FM WIDE mode3 does not work well through the repeater as VARA spends too much time trying to find the best speed, which often ends up being slower than VARA FM NARROW mode. Those who have a good path to the repeater regularly achieve VARA FM NARROW mode Level 11 (12,750 bps), though the average is more typically level 9 (about the same as 9600 packet except with FEC and compression).

In theory, a VARA FM digipeater4 at the same location running VARA FM WIDE mode could provide marginally better performance, assuming most users would be able to achieve level 11 or higher, but there would still be the issue of hidden terminals / hidden node problem.

Keep in mind, using a digipeater drops the overall throughput in half or more since each data block needs to be sent twice. With timing and overhead, it works out to more than a 50% hit on throughput.

With a VARA FM digipeater there is also the issue of running a Windows computer at a remote location with limited access. This would have to be a stripped down Windows install with no network access. With Microsoft's current direction, building such a system is getting much more complicated and difficult. A regular Win11 machine on a mountain top would likely be very frustrating to maintain and probably not very reliable.

There may be an added benefit to using a voice repeater operationally. During an emergency activation with ARES/RACES users needing to send a lot of digital messages (we have standardized on Winlink, though you could use VarAC or even VARA Chat). This is going to result in contention for use of the frequency / repeater (this has proven to be the case, even when using 1200b packet on a busy frequency. In our experience, Packet Radio's CSMA/CD (Carrier Sense Multiple Access / Collision Avoidance) on a simplex frequency doesn't work in most cases.

Our plan would be to establish a "Data Net Control station" on the data repeater using voice to sequence operations. Yes, that does mean people would have to listen to the VARA FM noise, but VARA FM connections are relatively short, so it might not be too annoying. We have not tested this procedure

yet.

An interesting side note - we have tested regular AFSK (Audio Frequency Shift Keying) 1200 bps packet through this repeater, and it works well even without doing bit regeneration. This eliminates the hidden terminal problem and CSMA/CD actually works much more efficiently!

Discussing the configuration of the FM repeater to have zero drop delay / hang time, it might seem advantageous to have a *non-zero* drop time, but apparently VARA FM is capable of sensing carrier drop, faster than the cessation of data traffic, to decide that the channel is clear.

The testing of this test repeater optimized for VARA FM is being done in San Luis Obispo County, CA, among the SLO County Amateur Radio Emergency Services (ARES) teams. To date, usage of the test repeater has been by those involved in ARES. The SLO County ARES teams work with the California Office of Emergency Services (CalOES) at the county level. Teams are spread across the county in 5 general areas:

- South County
- Central County
- North County
- North Coast
- Estero Bay

We also have a liaison to the California Polytechnic State University at San Luis Obispo (Cal Poly) campus and W6BHZ, the Cal Poly Amateur Radio Club, which hosts a Winlink Gateways on campus. See https://www.sloecc.org/ for more information.

Terrain Challenges

The San Lucia Mountains in the Central Coast separate these areas from an RF perspective. The Cuesta Grade separates South and Central county from North county, and the ridge continues along the coast to separate North Coast and Estero Bay. Our hilltop repeaters link these areas, but in the case of data systems, these create the ideal situation for hidden terminals. If you look at our packet network with the terrain map, it is pretty easy to see what we are up against:

https://www.google.com/maps/d/edit?mid=13wao94dYtEVnjIZ38QzoOwEixW9oodE&usp=drive_link

I'm in Paso Robles. Connecting to stations in San Luis Obispo, Arroyo Grande, Cambria or Morro Bay is impossible without the network nodes. The County Emergency Operations Center (EOC) is located in a valley off Highway 1 to the west of San Luis Obispo. There's no radio paths in or out of at location without repeaters. So, we need the peaks, but the isolation is really good. I can't hear any stations south of Santa Margarita, and they can't hear me. We are bound to transmit at the same time. Cuesta Peak and Tassajara Peak link these regions together.

Summary

Scott has performed admirable research (testing various parameters for more than a year) which resulted in a easy-to-replicate, reliable, reasonably fast (~ 10 kbps) wide area data communications system for Amateur Radio use. This is *significantly* faster than typical Amateur Radio Packet Radio operating at 1200 bps, with no FEC, and if digipeaters are used, half duplex and thus prone to collisions from hidden terminals / nodes.

It's notable that a "VARA FM" repeater such as NS7C has developed can be "basic" and thus inexpensive (and also, minimal for maximum reliability). With the use of VARA FM "NARROW" the radios can be any VHF or UHF radio (connected via speaker and microphone connections) and any audio interface is capable of the bandwidth required for VARA FM NARROW.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

University of Pennsylvania Amateur Radio Club Wireless Luncheon

Email from John Campbell W3MHZ / W3KZ:

> Greetings! On behalf of W3KZ - the University Of Pennsylvania Amateur Radio Club (UOPARC), and the Moore School [of Engineering] at the University of Pennsylvania, I wanted to extend the below invitation for a ZOOM meeting Saturday, October 18, 2025 at 11 a.m.
>
> This may be timely as we too are talking about Meshtastic and Amateur Radio and have bought Seed T1000Es some for W3KZ. Philly Mesh will be presenting.
>
> This is primarily a networking event with Penn Alums, Students and many friends in the broader amateur radio and wireless communities.
>
> A rough agenda is below. We plan on an hour and will leave the ZOOM call open after we finish so our guests can interact for any "meeting after-the-meeting" since we hope to have many of the area ham radio clubs represented.
>
> We have invited the other local universities - Villanova, Drexel, Temple, Ursinus, our not too distant friends at University of Scranton W3USR.
>
> We have invited clubs such as Ham-Sci, MARC, HARC JFDNA, Free Library of Philadelphia Amateur Radio Club, Delaware Valley OMIK,

AMSAT, ARRL, etc..

Please join if you can and feel free to invite anyone appropriate to the ZOOM call.

…

The Moore School of Engineering at The University of Pennsylvania, in collaboration with W3KZ - The University of Pennsylvania Amateur Radio Club, invites you to join us for our Penn Wireless Luncheon.

This gathering brings together alumni, faculty, staff, friends, and current Penn students from the amateur radio and wireless communities. Join us for technical discussions, hands-on activities, and engaging conversation with fellow enthusiasts.

We'll be hearing from students, alumni, WM3PEN, ARES, and Philly Mesh. We also hope to hear from you, our guests!

Event Details

Date: Saturday, October 18, 2025

Schedule:

11:00 AM - 12:00 PM — Meeting in Levine 307 (Zoom available)

https://upenn.zoom.us/j/97296390406?pwd=8t79Jet5ETDAiHBQkrnkmzH4geeNUB.1

Meeting ID: 972 9639 0406

Passcode: 420045

12:00 PM — Lunch and amateur radio activities in Levine Hall rear courtyard

Location:
Levine Hall
3330 Walnut Street
University of Pennsylvania
Philadelphia, PA 19104
Maidenhead Grid: FM29sx

I know that there are a number of Zero Retries readers in the Philadelphia area, but I also included this item because of their specific mention about “radio fun” such as Meshtastic, SDR, and a makerspace. Kudos to UOPARC for reaching out to the University of Pennsylvania community to stoke interest in radio technology and Amateur Radio. The above card is also pretty cool!

FCC FACT SHEET In re: Delete, Delete, Delete - Direct Final Rule – GN Docket No. 25-133

> Background: The Direct Final Rule marks the next step in the Commission’s continuing effort to modernize the Commission’s regulatory framework and pave the way for the next generation of innovation. The “In re: Delete, Delete, Delete” proceeding launched a sweeping review aimed at eliminating outdated rules, reducing unnecessary regulatory burdens, accelerating infrastructure deployment, promoting network modernization, and spurring innovation.

Justin Overfelt AB3E via email:

> This FCC document dated October 7, 2025 seems Zero Retries Interesting:
>
> https://docs.fcc.gov/public/attachments/DOC-415063A1.pdf
>
> My summary of the Part 97 changes is below:
>
> - Removes “97.27 FCC modification of station license grant” (This apparently restates 47 USC 316 and is deemed redundant)
> - Removes “97.29 Replacement license grant document.” (Yep, this is the one ARRL and multiple others called out - a slam dunk)
> - Removes 97.315 (b)(2) A carve-out for amplifiers produced or bought before 1978 saying they don’t have to be certified - I actually think this could affect some people still hanging onto old gear, but I don’t disagree with its removal.
> - Remove 97.521(b) Saying you have to be qualified to be a VEC in one of the VEC regions in Appendix 2 (FCC says VECs no longer organized by region and remote testing makes this moot)
> - Remove Appendix 2 (apparently only referenced in 97.521(b)

> So all of the “clearing out dead wood” variety. Here’s hoping for some more substantial fixes upcoming.

I concur with AB3E’s assessment that these are minor changes to Amateur Radio regulations. To me, these items related to Amateur Radio (and a few other items in this document that I looked at) seem like “easy wins” - pretty non-controversial and easy to implement by removing small bits of regulatory verbiage.

While I still feel that it was important for Amateur Radio to “show up” and comment in GN Docket 25-133, I don’t think that the comments that Amateur Radio filed - notably by me, Open Research Institute (ORI) and ARRL, however well composed and reasoned, for substantive change in Amateur Radio (such as deleting symbol rates and bandwidth limits on Amateur Radio VHF and UHF bands) will be implemented by the FCC. To effect such changes, some significant “forcing function” will be required, such as “Amateur Radio” filing a Petition for Rulemaking. That’s not an “impossible” barrier for substantive regulatory change, but it’s a substantial one.

I’m grateful to Justin Overfelt AB3E for mentioning this to me. At date of publication, I haven’t seen mention of this anywhere else.

Help Track Our Light Sail! - Setting Up a Ground Station for the Cornell Alpha Mission

Email from Joshua Umansky-Castro, forwarded to me:

> **Date:** October 7, 2025 at 12:26:01AM CDT
>
> Greetings from Ithaca!
>
> If you’re receiving this message, you expressed interest in setting up a ground station to support Cornell University’s Alpha CubeSat mission. It took a few more years than anticipated, but we’re excited to share that we’ve launched!! Here’s a news article commemorating the milestone.
>
> Our CubeSat along with its ChipSat-sail payload are now stowed onboard the International Space Station. On November 17th, the CubeSat will be released into space. A few days after that (if all goes well), the CubeSat will deploy the sail! At that point **we’ll need all the help we can get to collect data from the sail’s ChipSats in the very limited (less than 48hrs) time they are in orbit!**
>
> By mid-November we encourage you (and anyone you may know) to **set up a small low-cost ground station** to help collect data from our sail and to establish a LEO-to-ground link for our next-generation ChipSat spacecraft. I’ve made a guide that provides some background on the mission and walks you through all the steps on how to set up the station.
>
> **Link to guide**: https://cornell.box.com/s/n4se5ku0ltjb1of2piagfz1y7xa92n47
>
> **Please share the guide with as many people as you can!** The more people listening for the ChipSats the better, especially if they are geographically widespread. Also **if you have any questions, please reach out to both myself and sail-designer Andy Filo.** We are more than happy to assist you with your ground station setup!
>
> Contact info:
>
> Joshua Umansky-Castro <jsu4@cornell.edu>
>
> Andrew Filo <43dprinting@gmail.com>
>
> Thanks again for your support of our mission! After so many years of development, it’s admittedly nail-biting that my time to demonstrate the tech in space comes down to just a few hours. Your help has a huge impact on making the most of the sail’s short time in orbit!
>
> Best regards,
>
> **Joshua Umansky-Castro**
> PhD Candidate, Aerospace Engineering
> Space Systems Design Studio
> Cornell University

(The link to download the ground station document is pretty slow, but it does eventually work.)

Light sails, though theoretically simple, still seem to me like technology straight out of science fiction, though a brief web search showed that there have actually been a few launched.

Having a new ground station online by 2025-11-17 might seem like a tight deadline, but this specific ground station hardware seems like it’s a pretty simple system to build. The ground station they’re requesting to be built *is* pretty simple and inexpensive. The simplest version is a LoRa board for 433 MHz and a ground plane (omnidirectional) antenna. The software is the same as TinyGS - see the document for full details.

This seems like a cool project that’s pretty easy and inexpensive to build, especially for techie kids / families / makers (and STEM classes, makerspaces, NewTechHams, etc. The light sail aspect really stirs the imagination!

Video - HackRF Portapack Evolved? This is PortaRF

> This is the new evolution of HackRF Portapack. A relatively cheap portable SDR device, capable of receiving, analysing, decoding and even transmitting a wide variety of radio signals. But now in a sleek new design, with a much better and bigger screen and battery and some new internals. A useful toolkit for anyone interested in wireless communication. This is PortaRF.

This is a travel week and Pacificon 2025 weekend, so I haven't been able to check out this video, but it certainly looks like an interesting unit!

My thanks to Zero Retries Founding Member Joe Hamelin W7COM for mentioning this item to me.

Dire Wolf Version 1.8 Beta Test

John Langner WB2OSZ in the direwolf email list:

> A Beta Test version of direwolf 1.8 is now available in the "dev" branch. Experienced users are invited to try it and report any significant issues that should hold up the release.
>
> Linux users should build from source in the usual way. Be sure to specify "git checkout dev" to get the Beta Test version.
>
> Windows users can download a pre-built version here: https://github.com/wb2osz/direwolf/releases
>
> **New Documentation:**
>
> - All APRS users should read Understanding APRS Packets. Be sure to read the section on common mistakes or you might be used as an example of what not to do.
>
> **New Features:**
>
> - Added support for libgpiod version 2. This is needed for GPIO PTT on Raspberry Pi OS 13 trixie. You will need to install libgpiod-dev before building.
> - Support for CM108 PTT on Mac.
> - New NCHANNEL feature to map a channel number to an external network TCP KISS TNC. See APRS-LoRa-VHF-APRS-Bridge.pdffor explanation and example.
> - http://www.aprs.org/aprs11/tocalls.txt has been abandoned since the end of 2021. https://github.com/aprsorg/aprs-deviceid is now the authoritative source of truth for the vendor/model encoding.
> - New direwolf icon.
> - New direwolf icon is now embedded in the Windows executable. Note: When building from source, environment variable RC must point to windres location.
> - Enhanced IGate functionality to allow downloading from all CWOP servers concurrently.

Dire Wolf (that's the capitalization used on the reference Github page) is one of the primary enabling technologies of Amateur Radio Packet Radio of the 21st century, and as this illustrates, still in very active development.

Jesse Alexander WB2IFS - Keynote at GNU Radio Conference 2025

Shared out from a private email list to the HamSci email list by Nathaniel Frissell W2NAF:

> Hello Hams,
>
> I really enjoyed speaking at Gnu Radio Conference. Many Thanks to the GRCon 2025 entire team--especially Sam KM4SXP and Josh Morman. And thanks to Dr. Kristina Collins KD8OXT for recommending me as a keynote speaker.

> You can watch the recording of my keynote here in the first 30 mins:
>
> https://grcon.stream/
>
> My keynote was first on Friday morning.
>
> Here's my brief trip report: https://www.eyepoet.net/post/2025/09/15/GRCon2025-After-Action.html
>
> I also took a few pictures that you can see here: https://flic.kr/s/aHBqjCtMrv
>
> TNX ES 73,
> Jesse Alexander, WB2IFS/3
> OMIK Amateur Radio Association, Inc.
> SKYWARN #PG116
> Mastodon: @wb2ifs@mastodon.hams.social
> wb2ifs@arrl.net
> QTH: FM18ns

WB2IFS is *accomplished!!!* The title of his keynote is Ham Radio: greatest hobby in the world. Remember, he's a keynote speaker at a conference that's all about Software Defined Radio… *and he chose to discuss Amateur Radio!*

I was present for this keynote, and it was *great* - recommended! At least watch the first five minutes for a great video clip (which admittedly took a bit of license with the realities of Amateur Radio), but that's completely forgivable.

OpenRTX 0.4.2 Released

Email from Ryan Turner K0RET let me know about this development:

> Today, OpenRTX maintainer Silvano Seva (IU2KWO) released OpenRTX version 0.4.2. This is primarily a maintenance release focusing on GPS, but there are other changes that you may notice too. First and foremost, download the release on **GitHub**, and follow **these steps** for how to flash it.
>
> This release contains **63 commits between 8 contributors** and, we think you'll love it! Next, let's dissect the release a bit and talk about all of its goodness.
>
> ### DC block filter
>
> OpenRTX has, out of necessity, a DC filter on the mic input in processed modes so that the encoded signals are clean. Previously though, this filter resulted in noise being passed forward (and created!) when there were very low levels. This was heard as noisy artifacts during quiet times when transmitting M17.
>
> Silvano addressed this by incorporating an **improved DSP algorithm** that introduces noise shaping. In our testing, this significantly improved the amount of artifacts generated when using the M17 mode in typical uses. Note that this filter is applied on the transmitter's side, so it will affect how other people hear you -- not how you hear other people.
>
> ### Improvements to GPS
>
> There were two main improvements to GPS this release. First, GPS drivers were refactored so that more capabilities can be leveraged. This was done in a way that limited maintenance overhead to ease supporting the existing radio platforms and make it easy to continue to add new ones. While these changes are "under the covers", they represent a substantial improvement in GPS handling, and along the way even a bug was found (and fixed).
>
> With this done, plus some platform bugs squashed (thanks JKI757!), now GPS on the CS7000-M17 Plus radio is enabled!
>
> A minor tweak too that you may notice if you don't have GPS on your radio: we now indicate that by showing "No GPS" on the screen rather than "GPS Off" or "No fix".
>
> ### Slight tweaks for RTC
>
> Besides showing you where you are, the only GPS feature present today is to set the clock. The behavior for this however was a bit unintuitive, and we've addressed that now. When you enable setting time from GPS now, the setting stays on, and the time is periodically synced with the GPS time.
>
> ### UX Tweaks: Battery Percentage, FM settings, and voice prompts
>
> The ability to show battery percentage rather than an icon was introduced (thanks Tarandeep Romana [VA1FOX]!), and this is available under the settings menu. Additionally, a new FM settings menu has been introduced so that options previously only available in the meta menu can be modified in the conventional way as well (thanks Imostlylurk!). Finally, some small tweaks to the displayed strings and the accessibility voice prompts were made, improving the overall coverage of the voice prompts.
>
> ### Developer experience and tech debt improvements
>
> ### A whole new style
>
> OpenRTX has had a formally-adopted coding style for a long time, but it was not adopted throughout the project, and it had some eccentricities compared to more mainstream C and C++ projects. OpenRTX has formally adopted the Linux Kernel code format (with a few documented tweaks). An effort has begun to update all of the existing code to conform to the style, and we encourage you to help! Learn more in the related **GitHub issue**.
>
> ### Improved dev environment

> Improvements were made to the **devcontainer** so that it can successfully flash all supported platforms. Devcontainer is now a recommended way to setup your local dev environment. Native setup is still supported.
>
> As part of this effort, the `bin2sgl` tool was ported to python (our preferred language for scripts) to make it more portable. This was our first documented AI-assisted contribution.
>
> Thank you Peter Buchegger (OE5BPA), for your work on DX and tools! Also, thank you Grzegorz Kaczmarek (SP6HFE) for ensuring the DM1701 is easy to build for on VSCode.
>
> **Improved platform tests**
>
> Silvano added platform tests for verifying a display, dumping the contents of the non-volatile memory (NVM), and tools for printing the calibration data from MD3x0, MDUV3x0, GD77, and DM1801 platforms. Updates were made to other tests as part of routine maintenance as well.
>
> Platform tests let OpenRTX contributors better support existing radios as well as expand to supporting new ones. Thank you Silvano for investing in this important part of the project!
>
> **Hacktoberfest preparation and kick-off**
>
> Last but not least, improvements to the developer experience were made to facilitate OpenRTX's first Hacktoberfest participation. We've improved CICD to build each platform, ensuring that feedback about build problems is automatic. We've added a contributing guide. And we've seen our first Hacktoberfest contributions land!
>
> If you're interested in contributing to OpenRTX, now is a great time to do so. And as always, drop in the chat and let us know how OpenRTX is working for you.

…

> The OpenRTX project develops free and open source firmware for digital ham radios created and maintained by:
>
> - Niccolò Izzo IU2KIN n@izzo.sh
> - Silvano Seva IU2KWO silseva@fastwebnet.it
> - Federico Amedeo Izzo IU2NUO federico@izzo.pro
> - Frederik Saraci IU2NRO frederik.saraci@gmail.com
>
> The firmware is designed with a top-down approach with the objectives of modularity, flexibility and high performance.
>
> Currently, it targets the following devices:
>
> - Tytera MD-380/390
> - Tytera MD-UV380/390
> - Tytera TYT MD-9600
> - Radioddity GD-77
> - Baofeng DM-1801
> - M17 project's Module17
> - Talkpod A36Plus MAX
> - Connect Systems CS7000-M17 and CS7000-M17 Plus

They're an amazing group, accomplishing a lot, especially in support of M17.

PocketPD Update: Announcing a New Version for Drone & Ham Radio Operators

Email from Crowd Supply / Centylab:

> We've got exciting news from Centylab! The PocketPD you know and love is now available in a new version, one designed with drone pilots and ham radio operators in mind.
>
> Instead of the standard screw-terminal block, this version ships with two unsoldered output connectors — an Anderson Powerpole PP15/45 connector and an XT60 connector. You choose the one that fits your setup best and solder it directly to the board. This addition is all about giving you more flexibility and cleaner integration with your gear.

PocketPD is a cool, small (pocket sized) variable voltage power supply with USB-C input.

I overheard some of the discussion between the two Centylab principals and attendees at Zero Retries Digital Conference 2025 about the need for these two adaptations of the PocketPD. Centylab works fast!

open.space

Exhibitor at Pacificon 2025:

An open-source communications hardware & software initiative empowering the public to connect across the world by bouncing signals off the Moon—and more!

A New Frontier for Ham Radio

Bouncing signals off the Moon—known as Earth-Moon-Earth (EME) communication—has long been the ultimate challenge for radio amateurs. It required large antennas, expensive equipment, and accurate manual pointing and tracking. We try to bring this down to Earth, providing all the tools needed to experience the thrill of space communication, with an open source software-defined phased array.

Open-Source Hardware

Expected to ship: March 2026.

Our first kit is a low-cost digital phased array, with high transmit power and excellent receive sensitivity. It supports flexible transmission modes across any 40 MHz bandwidth in the C-band (4.9–6 GHz).

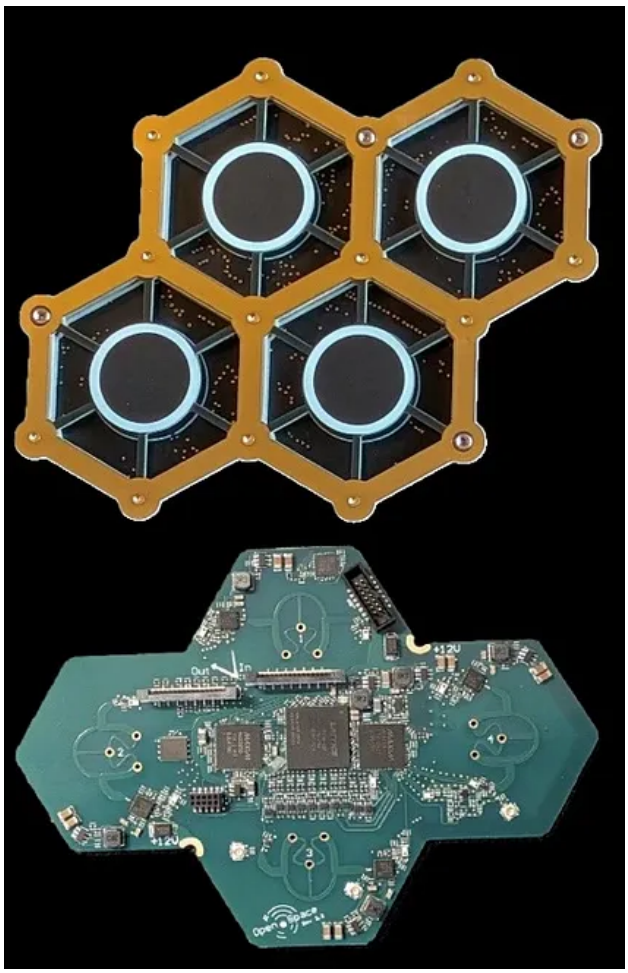

Image courtesy of open.space

Quad: A Software-Defined Radio Tile

Overview

This 4-antenna SDR tile designed for arraying. Drop-in compatible with Raspberry Pi pipelines (GNU Radio, Python/C++, SoapySDR) . Useful as a standalone SDR or as a building block for larger phased arrays.

Key features

- Frequency: **4.9–6.0 GHz** (C-band), full duplex
- Per-antenna bandwidth: **40 MHz**; 8+8-bit I/Q
- Tx power: **1 W** per antenna • Rx NF: **~1.2 dB**
- Polarization: **RHCP** (Tx), **LHCP** (Rx)
- MEMS TCXO • Jitter **~1.4 ps**

- FPGA: **Lattice ECP5** • Latency **< 1 ms**
- Power: **12 V DC** (≈25 W peak)

Standalone applications

- General-purpose 4×4 MIMO Software-defined Radio
- Fox-hunting, direction of arrival (DOA), RF exploration
- Open Wi-Fi router, Open 4G/5G base station
- Drone HD links, robotics communications

This image doesn't do justice to the concept. On display at Pacificon 2025 is a "dish" of "Quads" approximately 2.5 feet in diameter. I can't believe I didn't get a photo, but I I was on my way for something time-sensitive. If you need more resolution, or perhaps power, just add more "Quads". I'm sure there's a limit, but wow, this is an impressive concept. *They're going to be mobbed on Saturday.*

What leaped to mind is that they just solved the (hardware) uplink issues for any future Amateur Radio satellite, including GEO, that will use the 5 GHz band as an uplink. More next week after I get a chance to talk to them (if I can break through the crowd) at Pacificon.

Harald Welte joins ARDC's Board of Directors

> The team at ARDC is pleased to announce that on July 25, 2025, Harald Welte joined our Board of Directors.
>
> …
>
> His primary interest is in the area of communications protocols. He occasionally dabbles closer to the physical layer, but primarily lives in Layer 2 and above in the protocol stacks, including GSM, TETRA, and LTE. He is a frequent speaker on related topics at technical conferences, where many of the recordings can be found at media.ccc.de.
>
> …
>
> Despite working with radio and wireless communications for decades, he has never become a licensed ham. He hopes his background and experience will bring some insights and contacts into digital communications communities beyond the ham community and also to the ARDC board.

Not to diminish anything about Welte's joining the ARDC Board, but what I thought was most notable was *what wasn't said*… that Welte plans to get an Amateur Radio license. I think this is a healthy development for ARDC which does a lot of grant making outside of Amateur Radio, and thus there needs to be some balancing perspective on the ARDC Board. Welcome to ARDC, Harald!

Documentary Explores Collins Radio's Role in Creation of the Internet

> A new documentary exploring Collins Radio's role in the development of the internet will premiere Nov. 1 at the Collins Road Theatre in Marion.
>
> "The Collins Story – The Internet Connection" examines how Collins Radio Company in Cedar Rapids provided mobile radio technology for a network experiment that led to the internet's creation on Nov. 22, 1977.
>
> The documentary features interviews with engineers involved in the project, including Bob Kahn, former DARPA program director and current chairman, CEO and president of the Corporation for National Research Initiatives.
>
> "We needed somebody to build the radios and Collins was clearly the gold standard choice. That's why we picked them," Mr. Kahn said in the film.

The "mobile radio technology for a network experiment" was, *I think*, the very first (civilian) mobile packet radio experiments, or perhaps the AlohaNet experiments.

I sure hope this video gets released beyond the Arthur A. Collins Legacy Association.

Hush - An Open Source Alternative to VARA-HF

Nick Charros KC1WZQ on QRZ.com:

> Recently, I've been working on a new project called Hush (Ham Unified Signal Handshake). The name is still a work in progress; any ideas for acronyms would be appreciated!
>
> **What is Hush?**
>
> Hush will have many different features, such as much faster data rates than VARA or ARDOP, multiple different modes depending on the conditions (or manually changed), absolutely free (because I'm fourteen with a job, I don't need the money, maybe donations would be accepted!), a special QRP/DX mode similar to WSPR but with winlink or QSO in mind, and a lot more!
>
> Chats will also be integrated! This allows you to make QSOs a little easier and faster. Similar to VarAC.
>
> OFDM, QAM 4 - QAM 128, MFSK 4 - MFSK 128, MSK 4 - MSK 64, and many more modes will be used in Hush. QRP modes will use a mix of these.

> Email gateways will be implemented as well! Relays and Digipeaters are a possibility too.
>
> This is a soundcard mode, which means that you do not need to spend $1200 on a rig interface for this. It works with vox!
>
> **Why is this being created?**
>
> I cannot afford VARA's $70 license, which is an absurd price for the software. A lot of other hams complain, but give in to the price since there is no better alternative. Hopefully, if this mode takes off, it can open up the world of complex digital modes to everyone!

You have to admire KC1WZQ's ambition!

There's also Rhizomatica Mercury Modem as a potential, and open source alternative to VARA HF.

Video - MeshCore Presentation by Liam Cottle

I was able to watch about half of this video. It's an interesting explanation of Meshcore with a bit of comparison to Meshtastic. I've been reading a little bit about the "battle for hearts and minds" between the dueling philosophies (mostly, network topologies) between Meshtastic and MeshCore, and this helped me understand the differences.

Video - Ukraine's New Jam-resistant Battlefield Radios Signal Soldier-led Revolution

This was a great video explaining how rapid iteration in radio communications technology is vital to Ukraine's armed forces.

Technological innovation in radio technology really matters!

Leave a comment

Share

Comments Summary From Previous Issue

Comments from Zero Retries 0222:

- Great discussion by Ben Kuhn KU0HN - I had a few thoughts for your "How to Get (Re) Started..." article. Ben and my discussion will be an article in Zero Retries 0224.

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Type your email... Subscribe

Zero Retries Boilerplate

The **Zero Retries Store** is now open for business with quality Zero Retries branded merchandise and items being retired from Steve's N8GNJ Labs.

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham (The City of Subdued Excitement), Washington, USA, and linked to the Internet via **Starlink *Satellite* Internet Access**.

See the **Zero Retries Boilerplate** page for significant acknowledgements and other information relevant to Zero Retries. For new readers of Zero Retries, that page, and the **About Zero Retries** page has useful information to check out.

My ongoing ***Thanks*** to:
Tina Stroh KD7WSF for, well, *everything!*
Jack Stroh, Late Night Assistant Editor Emeritus
Shreky Stroh, Late Night Assistant Editor In training

***Annual Founding Members* who generously support Zero Retries financially:**
Founding Member 0000 - Steven Davidson K3FZT (Renewed 2025, *3rd year!*)
Founding Member 0001 - Randy Smith WU2S (Renewed 2025, *3rd year!*)
Founding Member 0002 - Chris Osburn KD7DVD (Renewed 2025, *3rd year!*)
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Founding Member 0016 - Prefers to Remain Anonymous 77 (New 2025)
Founding Member 0017 - Phil Karn KA9Q (New 2025)
Founding Member 0018 - Prefers to Remain Anonymous 95 (New 2025)

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You thousands of readers of Zero Retries without which there would be little point in publishing this newsletter.

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Keywords for this Issue

Zero Retries 0223 dated 2025-10-10

Amateur Radio, Centilab PocketPD, Collins Radio, **Data Communications**, **Digital Communications**, **Digital Voice**, **DV**, Dire Wolf Version 1.8 Beta, FCC Docket GN 25-133, Jesse Alexander, HackRF Portapack, Hush HF data mode, **Ham Radio**, Light Sail, MeshCore, **N8GNJ**, NS7C, open.space, OpenRTX, Pacificon 2025, **Packet Radio**, **Radio Technology**, **Software Defined Radio**, **Software Defined Receiver**, Scott Currie, **Steve Stroh,** VARA FM, VARA HF, WB2IFS, **Zero Retries, Zero Retries Digital Conference, ZRDC 2025**

*Keywords in **Bold** are regular mentions in each issue.*

Footnotes for this Issue

To see the relevant sentence for the footnote, just click the footnote number.

1

Exceptions:
WA4DSY 56k modem repeaters (no longer in use, that I'm aware of),
Icom Digital Data (DD) mode repeaters (only usable on 1240-1300 MHz),
Wi-Fi HaLow / 802.11ah (mesh networking, not repeater, usable on 902-928 MHz in North America)

2

CTCSS - Continuous Tone Coded Squelch System (often abbreviated as "PL" which was Motorola's version called Private Line). CTCSS is now nearly universally used to activate a specific repeater, and avoid activating other repeaters on the same frequency.

3

VARA FM WIDE mode can operate at speeds of up to 25 kbps, but requires a VHF / UHF radio with "flat audio" interfaces (no pre-emphasis or de-emphasis) and a high resolution audio interface. In contrast, VARA FM NARROW mode can operate at speeds of up to ~12 kbps, but can use *any* VHF / UHF radio (microphone and speaker connections) and *any* audio interface.

4

The use of the word digipeater for VARA FM is sometimes confused with a Packet Radio digipeater. The term digipeater is used with VARA FM as a *functional* description of relaying VARA FM data from one station to another via a third (or third and fourth - maximum of 2) stations. There is no interoperability between Packet Radio digipeaters and VARA FM digipeaters.